Why recycle used nuclear fuel?

Recycling conserves resources

Recycling is nuclear energy's response to the imperative: "***Reduce, Reuse, Recycle***." The *GNEP* aims to:

- ***Reduce*** the number of required geologic waste repositories during the 21st century to one and reduce the risk of proliferation.
- ***Reuse*** valuable parts of used nuclear fuel to maximize the energy from uranium ore.
- ***Recycle*** used nuclear fuel to minimize waste and control weapon-usable inventories.

What is used nuclear fuel?

When an atom of uranium fissions (splits), it releases energy. Nuclear power plants use *uranium* as fuel, rather than burning coal, natural gas, or oil. A nuclear fuel pellet contains a lot of energy. When used in current nuclear power plants, one uranium pellet the size of the tip of your little finger is equivalent to the energy provided by 1,780 pounds of coal, 17,000 cubic feet of natural gas, or 149 gallons of oil.

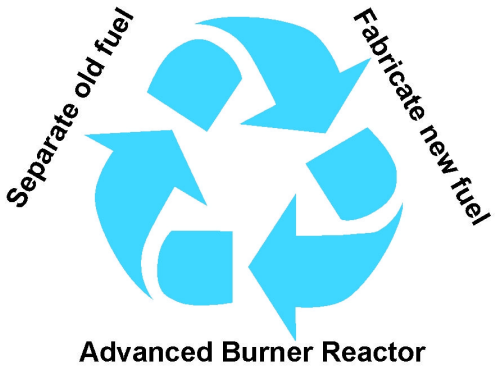
Used fuel that comes out of a power plant is only partially consumed. It has three major components: uranium, *transuranic elements* and fission products.

- About 94% is uranium. It has lower energy content than the uranium in fresh fuel, too low to use directly as fresh fuel.
- About 1% is transuranic elements, which are those artificial elements, like plutonium, that are beyond uranium in the periodic table; they are high-energy, toxic byproducts of neutron absorption in uranium.
- Less than 5% are fission products that result from splitting uranium or transuranic elements.

The uranium and transuranic elements in used nuclear fuel still have a lot of residual energy. However, the used fuel must be removed from the nuclear power plant partly due to the buildup of fission products that inhibits the self-sustaining fission reaction. So, fuel recycling requires separating fission products from uranium and transuranic elements.

Recycle plants

To recover the energy in uranium and transuranic elements and to transmute (consume) those toxic materials, we must separate the uranium and transuranic elements from the waste fission products and then fabricate new fuel. The new fuel will used in *Advanced Burner Reactors*.



The GNEP can lead to recycle plants that are substantial improvements over current practice. These plants would be located only in countries that are "fuel supplier nations," thereby increasing the proliferation resistance of the entire international system.

The GNEP separation and fabrication processes will keep all the transuranic elements together. This ensures reuse of all the transuranic elements, minimizes waste, and makes the material more proliferation-resistant than current practice.

By using these processes, with recycle in Advanced Burner Reactors, it will be possible to obtain the benefits of nuclear electricity without the need to build a number of new geologic repositories for ultimate waste disposal.

2/6/06